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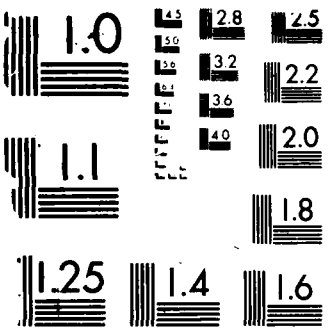

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# SEDIMENT FLUX IN A FIORD/SHELF TRANSECT OF AN ICE-DOMINATED CONTINENTAL MARGIN

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## Long-Range Scientific Objectives:

The long-range scientific objective is to understand the processes responsible for the flux of sediment from the land to the deep-sea in an arctic, ice-dominated environment. An important question is the role of fiord basins in this transfer. In fiords is the majority of sediment input at the head or is there substantial contribution from side-valleys along the length of the fiord? Do they act as major sediment sinks, and what proportion of sediment is contributed from the shelf as opposed to the fluvial (snowmelt) system?

## Project Objectives:

Piston and Lehigh cores, and surface grab samples, were obtained from three fiords in the eastern Canadian Arctic as part of the Canadian Sedimentology of Arctic Fiords Experiment (S.A.F.E.) Project in 1982 and 1983 (Fig. 1) (cf Syvitski, compiler 1984). These fiords head into a Proterozoic fold-belt (the Foxe fold-belt) characterized by meta-sediments (Tippett,

1984). Seaward, Archean granites and gneisses crop out along the fiord walls. Measurement of the gradients in the sediment flux of specific parameters denoting landward (shelf to fiord), or seaward (fiord to shelf) would provide an index of the sediment flux between fiords, and from the shelf into the fiords.

Current status and Progress in FY 1986:

Sediment flux on time-scales of 10's to 100's of years requires knowledge of the sediment density and rate of net sediment accumulation. An initial effort, still continuing, is to determine a chronology for the piston cores in Itirbilung and McBeth fiords. Because of the rarity of foraminifera or in situ molluscs in most cores this is a non-trivial problem (cf Andrews et al., 1985). Analysis of the pollen content of several fiord and shelf cores indicated Varying amounts of Pre-Quaternary pollen which confirm that the fine-grained acid-insoluble (AIOM) sediment fraction contained "old" carbon, hence radiocarbon ages are too old from such environments (Andrews et al., 1985; Andrews, 1987; Short, Mode, and Andrews, in prep.) (Fig. 2). A total of ten (10) dates have been obtained from six (6) cores in the two fiords. An empirical equation relating shell to AIOM dates (Andrews et al., 1985) is being used to construct isochrons on fiord accumulation. These estimates will be checked against paleomagnetic secular inclination curves from at least six of the piston cores (e.g. Andrews et al., 1986).

Sediment density is being estimated from shipboard measurements on Lehigh cores (Reasoner and Hein, 1984) and from volume/weight relationships on paleomagnetic samples.

Magnetic susceptibility measurements have been obtained on all piston cores and on surface samples (Andrews and Jennings, 1987) (Fig. 3). These data will be combined with XRD information on clay- and silt-sized mineralogy to model the downfiord dilution of the fiord-head signal as the primary sediment flux is added to be material from side-valleys and/or the shelf. SEM images of quartz sand grains are being used to discriminate between different source (glacial,fluvial,eolian) environments. Digitized images are being characterized by fourier analysis (e.g. Fig. 4).

References:

Andrews, J.T. 1987: Downcore variations in the carbon content of fiord piston cores and association with sedimentation rates. In: J. Syvitski (compiler). S.A.F.E. Data Report #3.

Andrews, J.T. and Anne E. Jennings, 1987: Influence of sediment source and style of sedimentation on magnetic susceptibility. Canadian Journal Earth Sciences, in press.

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Andrews, J.T. et al., 1986: Paleomagnetic record, texture, and mineralogy of Late Quaternary fiord sediments. Arctic and Alpine

Research, 18, 361-376.

Reasoner, M. A. and Hein, F. J. 1984: Sedimentology and geotechnical properties of surficial bottom sediments, Baffin Island fjords. In: J.P. Syvitski (compiler). Sedimentology of Arctic Fjords Experiment: HU83-028 Data report, Volume 2. Canadian Data report of Hydrography and Ocean Sciences, No. 28, Chapter 11 (111 pp).

Syvitski, J. P. compiler, 1984: Sedimentology of Arctic Fjords Experiment: HU83-028 Data Report, Volume 2. Canadian Data report of Hydrography and Ocean Sciences No. 28, 20 chapters with paginations.

Tippett, C. R. 1984: Geology of a transect through the southern margin of the Foxe Fold belt (mainly NTS 27B), Central Baffin Island, District of Franklin. Geological Survey of Canada, Open File 1110 and 1111, 73 pp and 83 pp.

Figure captions:

Fig. 1: Location map of fiords studied in the S.A.F.E. project.

Fig. 2: Organic carbon percentages (by weight) and percentage of Pre-Quaternary pollen in some fiord cores.

Fig. 3: Magnetic susceptibility trends on surface samples from Baffin Island fiords.

Fig. 4: Downcore variations in sand-sized shape in HU83-83.6 (McBeth Fiord).

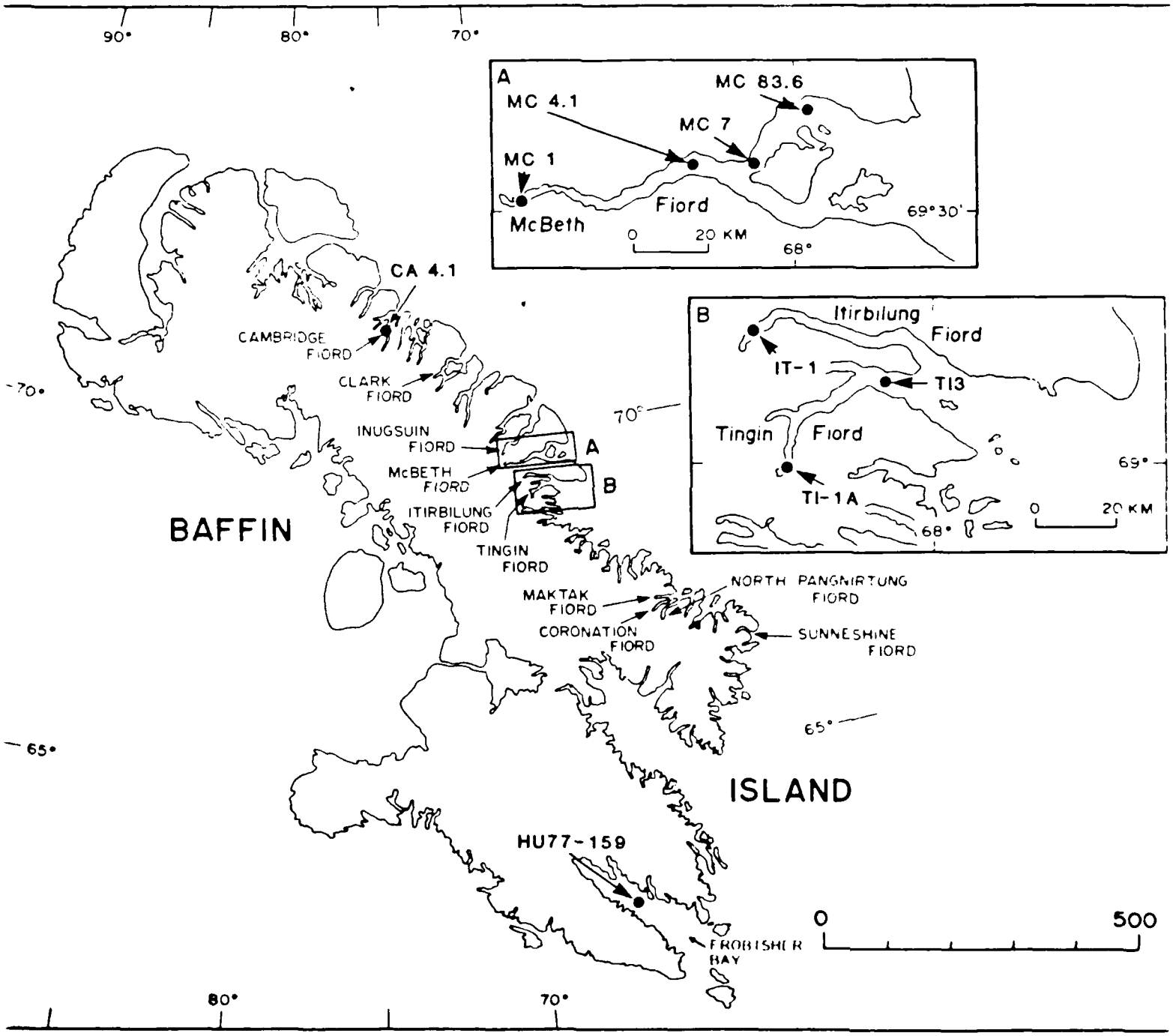



FIGURE 1. Location map of the eastern Canadian Arctic showing the location of the cores discussed

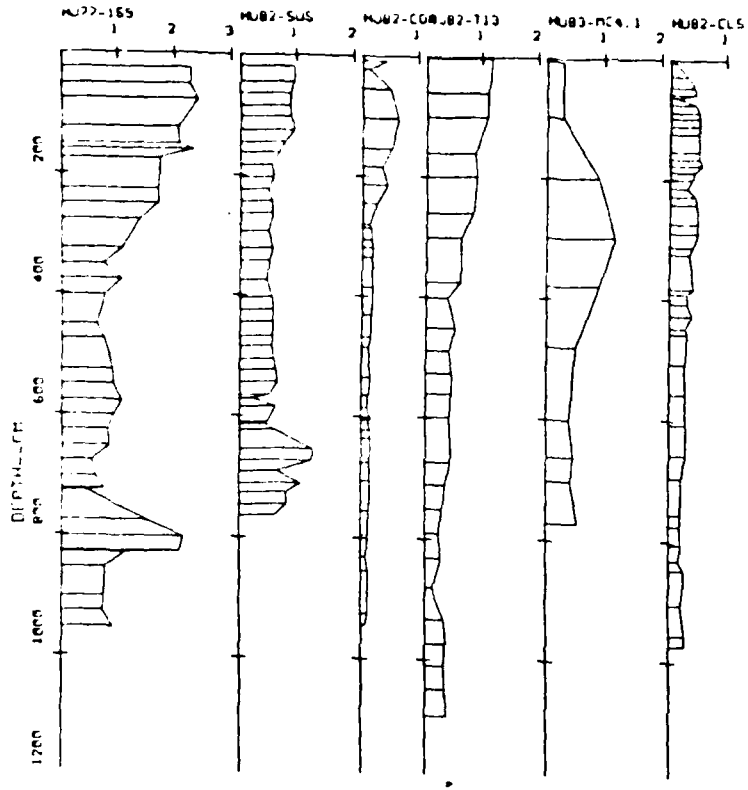
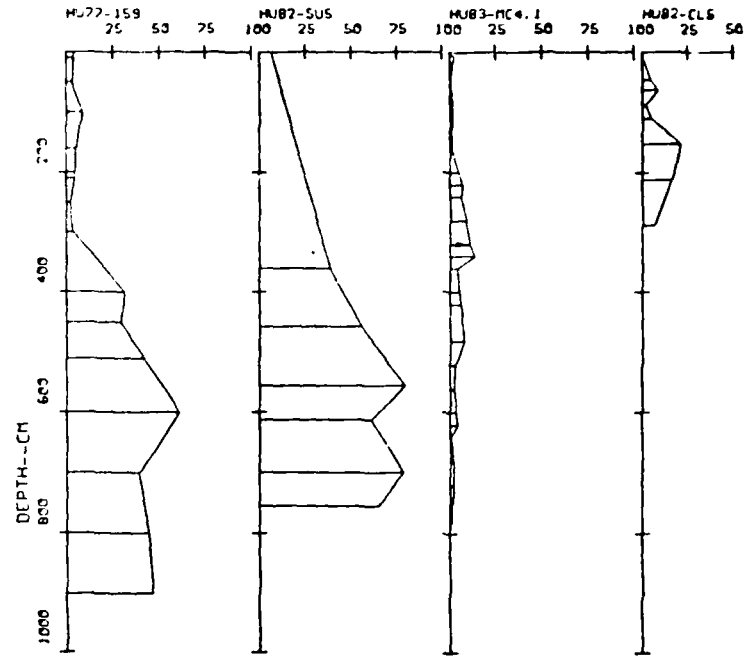


Figure 2: Organic carbon % by weight



Percentage of Pre-Quaternary/Total pollen

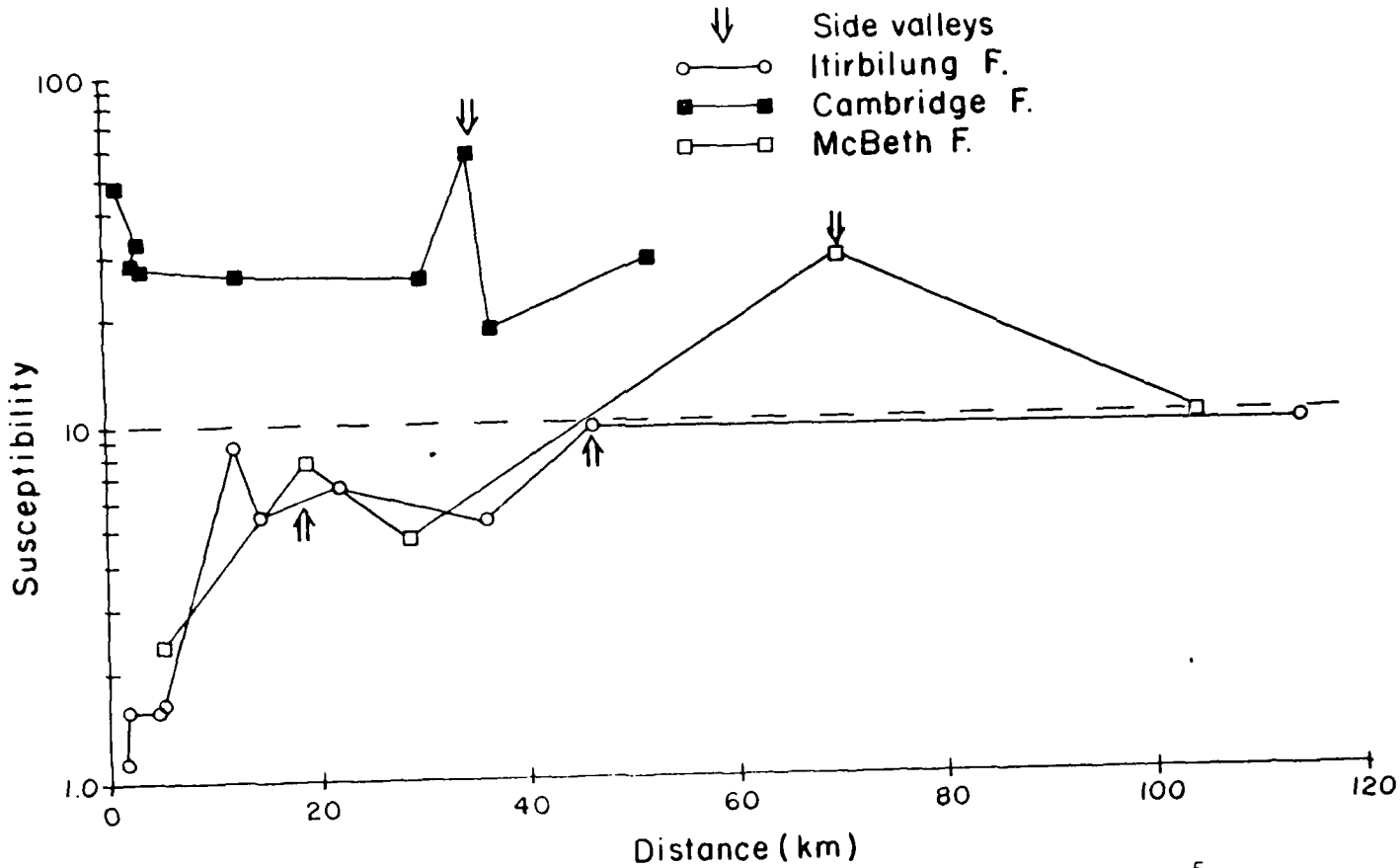
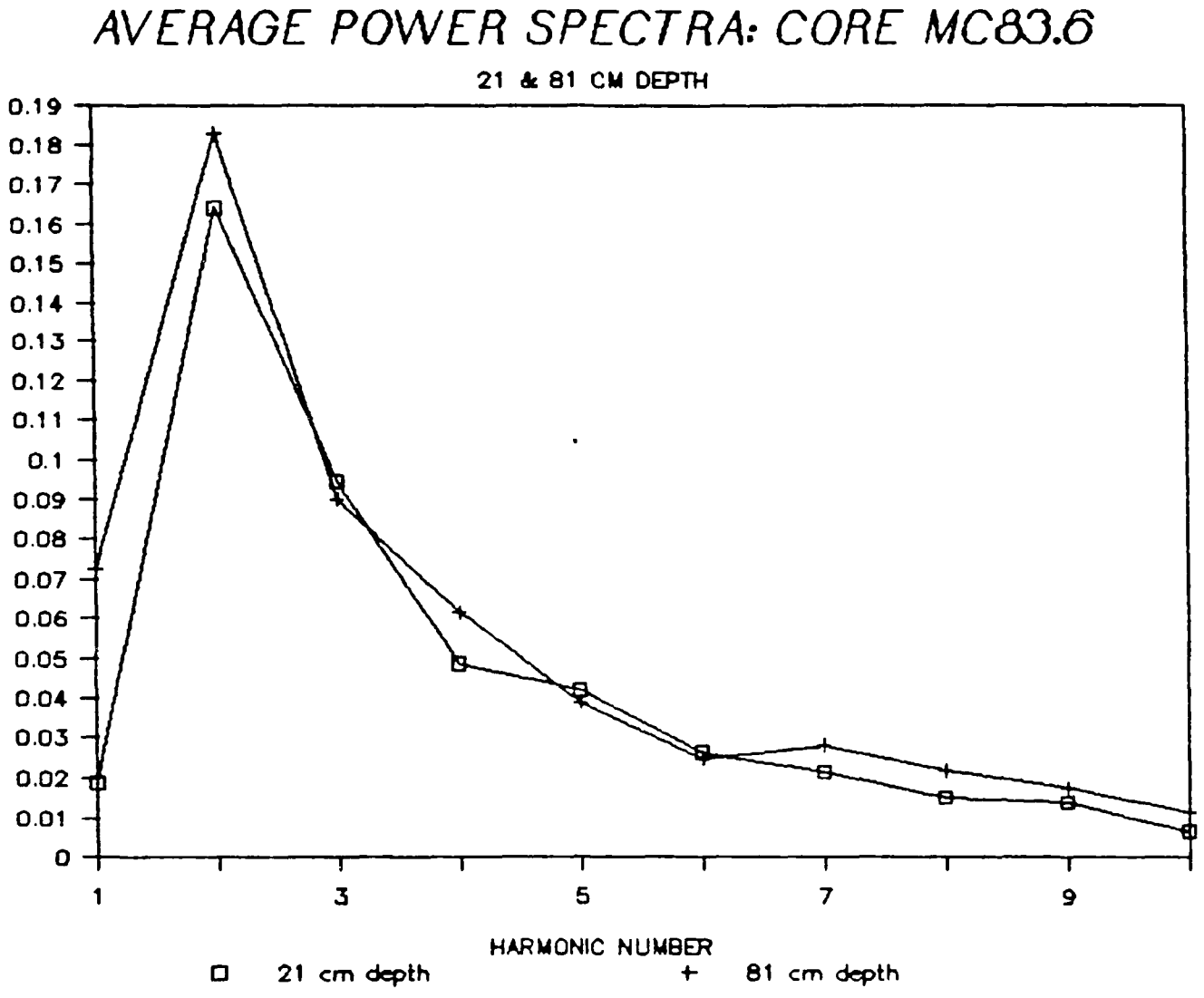



Figure 3: Downficrd variations in volume magnetic susceptibility (x $10^{-5}$ SI). Cambridge Fiord is entirely within the granites and gneisses of the Archean.


AVERAGE POWER SPECTRA: CORE MC83.6
21 & 81 CM DEPTH
0.19
0.18
0.17
0.16
0.15
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0.12
0.11
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
1
3
5
7
9
HARMONIC NUMBER
21 cm depth
81 cm depth

Figure 4

SECURITY CLASSIFICATION OF THIS PAGE

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19. ABSTRACT (Continue on reverse if necessary and identify by block number)

Piston cores from fiords along the eastern margin of Baffin Island, N.W.T. are being studied in order to compute variations in sediment flux on time-scales of decades to thousands of years. Radiocarbon dates indicate that sedimentation rates in outer basins range, on average, between 20-50cm/1 ka. The cores extend back to ca. 10 ka, or earlier, and provide possible analogs for conditions around the present day Greenland Ice Sheet. Grain-size, grain-shape and mineralogical studies are being carried out in order to evaluate down fiord variations in sediment source and sedimentation processes.

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